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Press Release

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Arsenic Compounds May Cause Genetic Damage by a Direct Mechanism

Research Triangle Park, NC...A possible direct link to DNA damage caused by arsenic compounds has been discovered by a team of scientists at a laboratory in EPA's Office of Research and Development in Research Triangle Park, NC. The research demonstrates that a human cell's own metabolic responses to arsenic exposure can produce compounds that can cause genetic damage.

Dr. Marc Mass, a toxicologist, and colleagues at the EPA's National Health and Environmental Effects Research Laboratory, and associates at the University of North Carolina in Chapel Hill, NC, and University of British Columbia in Vancouver, Canada, studied the effects of methylated trivalent arsenic on human lymphocytes in a test tube and on isolated DNA. The findings initially appeared online February 28, 2001, and appeared in the April 16 issue of *Chemical Research in Toxicology*, a peer-reviewed journal of the American Chemical Society.

The findings have potential for being used to develop a new biomarker for identifying arsenic toxicity in humans. AIt may give us a way to quantitate genetic damage in human populations exposed to arsenic," Mass said.

Inorganic arsenic, which occurs naturally in water and soil in certain parts of the United States, has been linked to cancer of the skin and internal organs as well as other diseases. For years, scientists searched for an interaction of arsenic compounds with DNA. Arsenic induces a range of genetic alterations which were thought to involve an indirect mechanism of interaction with DNA, making arsenic unusual with regard to other carcinogens. The present research shows that arsenic actually can induce these genetic alterations by direct DNA interaction.

The EPA study found that methylated trivalent arsenic derivatives, which can be produced by the body in an attempt to detoxify arsenic, result in reactive compounds that cause DNA to break. Previously, scientists had assumed that methylation of arsenic in the body was a detoxification mechanism and resulted in biologically less active arsenic compounds. EPA's research not only found a link to DNA damage, but identified methylated trivalent arsenic as at least one of the culprits. With this and other research, the EPA will continue to look at the available science on the health impacts of exposure to arsenic as it considers how to effectively and appropriately manage that exposure.

"These laboratory findings have caused our research team to rethink our views on how arsenic impacts cellular chemistry and causes toxicity," Mass said. "We are continuing to examine exactly how the DNA breakage occurs," he said.

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